299-E33-290 (A7086)

Log Data Report
(REVISION 2)

Borehole Information:

Borehole:	299-E33-290 (A7086)		Site: 216-B-38 Trench		
Coordinates (WA State Plane)		GWL[1] (ft): n/a[2]		GWL Date: n/a	
North (m)	East (m)	Drill Date	TOC[3] Elevation (ft)	Total Depth (ft)	Type
137353	573436	08/82	666.16	50	Cable tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Steel	1.5	8.625	8.0	0.3125	0	50

Borehole Notes:

The logging engineer measured the pipe stickup at the borehole using a steel tape. Calipers were used to measure casing outside diameter and thickness; the casing inside diameter is calculated. A gravel pad, 1.5 to 2 ft thick, lies on top of the ground surface surrounding this borehole.

According to *Hanford Wells* (Chamness and Merz 1993) the borehole was grouted. Coordinates and top of casing elevation are derived from HWIS[4].

Logging Equipment Information:

Logging System:	Gamma 1D		Type: SGLS (35%)
Calibration Date:	09/00	Calibration Reference:	GJO-2001-243-TAR
		Logging Procedure:	MAC-HGLP 1.6.5
Logging System:	Gamma 1C		Type: HRLS
Calibration Date:	02/02	Calibration Reference:	GJO-2002-309-TAR
		Logging Procedure:	MAC-HGLP 1.6.5

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1				
Date	10/08/01				
Logging Engineer	Musial				
Start Depth (ft)	51.5				
Finish Depth (ft)	1.5				
Count Time (sec)	100				
Live/Real	R				
Shield (Y/N)	n/a				
MSA Interval (ft)	0.5				
ft/min	n/a				
Pre-Verification	A0010CAB				

Log Run	1				
Start File	A0011000				
Finish File	A0011100				
Post-Verification	A0011CAA				
Depth Return Error (ft)	0				
Comments					

High Rate Logging System (HRLS) Log Run Information:

Log Run	1	2			
Date	02/11/02	02/11/02			
Logging Engineer	Kos	Kos			
Start Depth (ft)	24.0	43.0			
Finish Depth (ft)	36.0	51.5			
Count Time (sec)	300	300			
Live/Real	L	L			
Shield (Y/N)	N	N			
MSA Interval (ft)	0.5	0.5			
ft/min	n/a	n/a			
Pre-Verification	D0004CAB	D0004CAB			
Start File	D0004000	D0004025			
Finish File	D0004024	D0004042			
Post-Verification	Not saved	Not saved			
Depth Return Error (in.)	0	0			
Comments	No fine-gain adjustments.	No fine-gain adjustments.			

Logging Operation Notes:

SGLS and HRLS logging were performed in this borehole during October 2001 and February 2002, respectively. The reference depth for logging measurements is the top of casing. The HRLS was utilized to perform logging in high gamma flux zones, generally where the SGLS dead time exceeded 40 percent.

Analysis Notes:

Analyst:	SS/PH	Date:	03/22/02	Reference:	MAC-VZCP 1.7.9, Rev. 2

This Log Data Report is a revision of the report originally issued 01/11/02. This revision includes high rate data analysis results and a comparison with 1992 RLS data not previously reported.

Pre-run and post-run verification spectra for the SGLS were evaluated. The acceptance criteria for field verification of the Gamma 1D logging system are in the process of being established. Examinations of spectra indicate that the detector appears to have functioned normally during the log runs, and the log data are provisionally accepted, subject to further review and analysis. The HRLS post-run file was not saved properly. The pre-run verification passed acceptance criteria.

A casing correction for 0.3125-in.-thick casing was applied to the data.

Individual spectra were processed in batch mode using APTEC Supervisor to identify individual energy peaks and determine count rates. Concentrations were calculated in EXCEL, using an efficiency function and corrections for casing as appropriate. EXCEL templates named G1dJul01.xls and G1cFeb02.xls were used to process the SGLS and HRLS data, respectively. Dead time corrections are applied to log data, including the total gamma data, where the dead time is in excess of 10.5 percent. In zones of high dead

time (> 40%), gross count rates and radionuclide concentrations become increasingly less reliable, and may be significantly higher than reported values. The HRLS is used in zones of high SGLS dead time to quantify the ^{137}Cs concentrations. The ^{214}Bi peak at 1764 keV was used to determine the naturally occurring ^{238}U concentrations rather than the ^{214}Bi peak at 609 keV. The 609-keV energy peak cannot be distinguished as a result of interference from the ^{137}Cs peak at 662 keV in higher concentration zones.

Log Plot Notes:

Separate log plots are provided for man-made radionuclides (^{60}Co and ^{137}Cs), naturally occurring radionuclides (^{40}K, ^{238}U, and ^{232}Th [KUT]), total gamma and dead time, and a combination plot of man-made radionuclides, KUT, total gamma, and moisture. Moisture data are derived from the Waste Management Federal Services NW Radionuclide Logging System (RLS) measurements acquired in 1999. Data collected with the HRLS are substituted for SGLS data where appropriate to provide a continuous record of the ^{137}Cs concentrations. In addition, a comparison plot is provided of SGLS, HRLS, and RLS (1992 and 1999) ^{137}Cs concentrations.

For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction.

Results and Interpretations:

^{137}Cs and ^{60}Co, which are man-made radionuclides, were detected in this borehole. A zone of ^{137}Cs contamination was detected near the ground surface (log depth 1.5 through 9.5 ft) with activities ranging from 0.2 to 17.5 pCi/g. ^{60}Co was detected with an activity of about 0.2 pCi/g at 44.0 and 44.5 ft near the detection limit of the SGLS. A second zone of contamination between about 22 ft and the total depth of the borehole required HRLS measurements where the SGLS dead time exceeded 40 percent. The maximum concentration measured with the HRLS is about 70,000 pCi/g at 28 ft. ^{137}Cs concentrations at the bottom of the borehole remained in excess of 6,000 pCi/g, suggesting the borehole did not penetrate all of the contamination.

The comparison plot of SGLS, HRLS, and RLS data shows good agreement and indicates no changes in the profile since 1992. The RLS concentrations were decayed to February 2002 to provide for the comparison. In 1992, ^{60}Co was detected over the interval of 35 to 45 ft (depths shifted to compare with the 2002 logging) at less than 0.5 pCi/g, and most of this ^{60}Co has decayed to below the SGLS's detection limit. Hence, the detection of ^{60}Co at 44.0 and 44.5 ft versus 41.5 and 42.0 ft on the decayed 1992 data does not suggest movement, but rather detection of ^{60}Co by both tools at activities near their detection limit. Moisture measurements collected by Waste Management NW in 1999 indicate relatively higher moisture content in the sediments at the top of the zones of higher gamma flux.

Above the zone of intense gamma-ray activity, apparent ^{40}K activities are about 12 pCi/g. The increase in ^{40}K activity to about 18 pCi/g at 36 ft may represent the transition from the coarse-grained sediments of the Hanford H1 to the finer grained sediments of the Hanford H2.

References:

Chamness, M.A. and J.K. Merz, 1993. *Hanford Wells*, PNL-8800, prepared by Pacific Northwest Laboratory for the U.S. Department of Energy.

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[1] GWL – groundwater level
[2] n/a – not applicable
[3] TOC – top of casing
[4] HWIS – Hanford Well Information System

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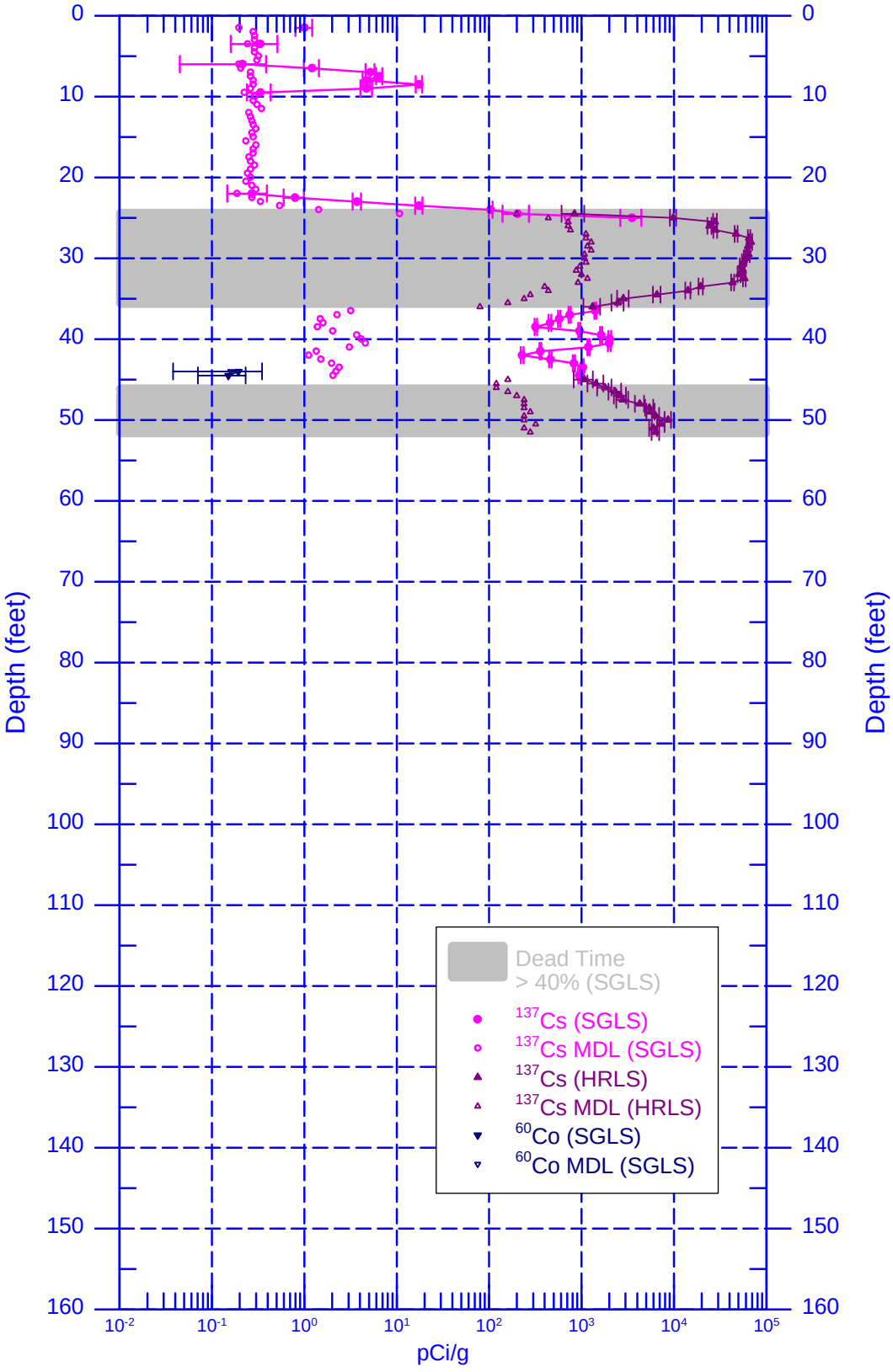
Man-Made Radionuclides



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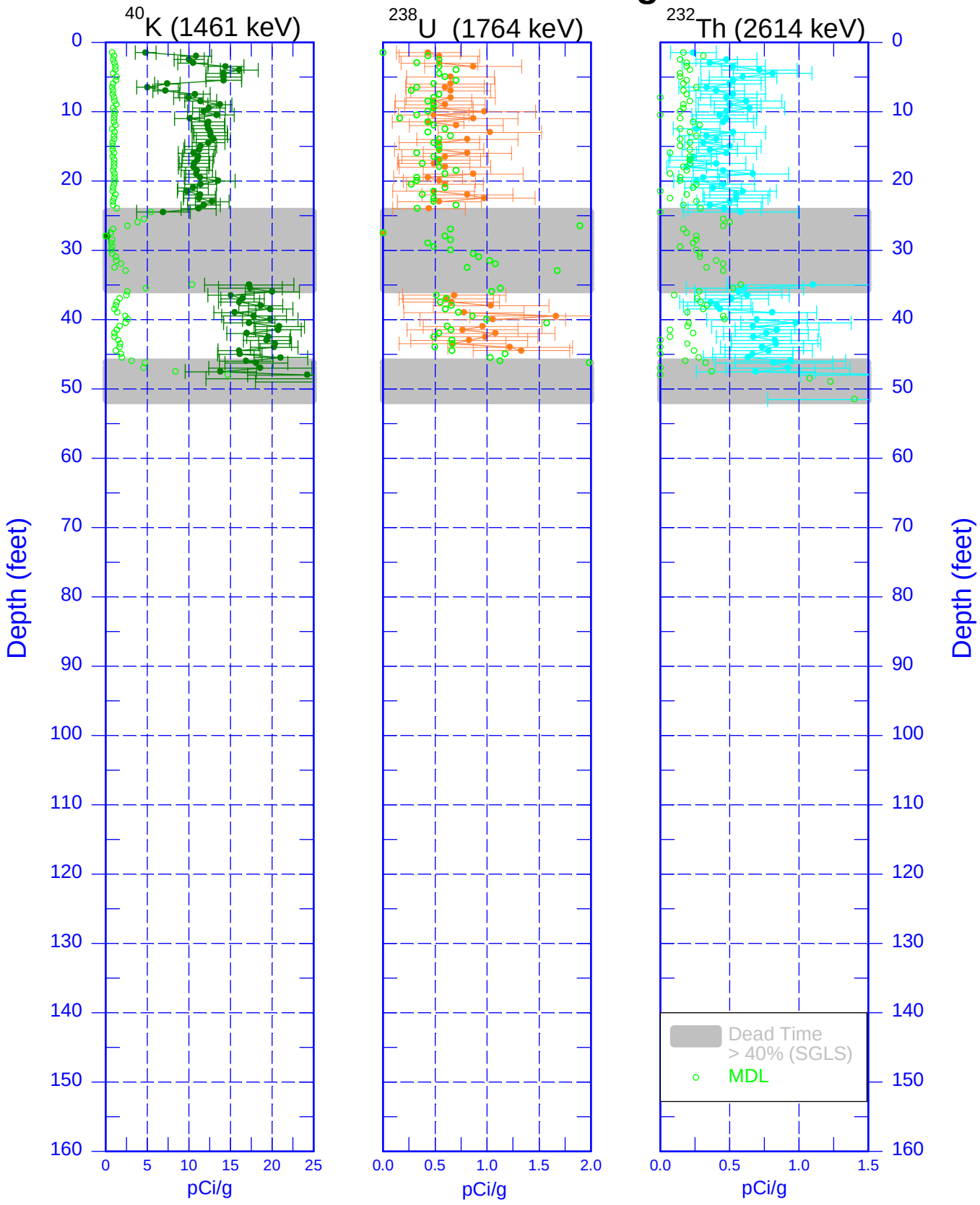
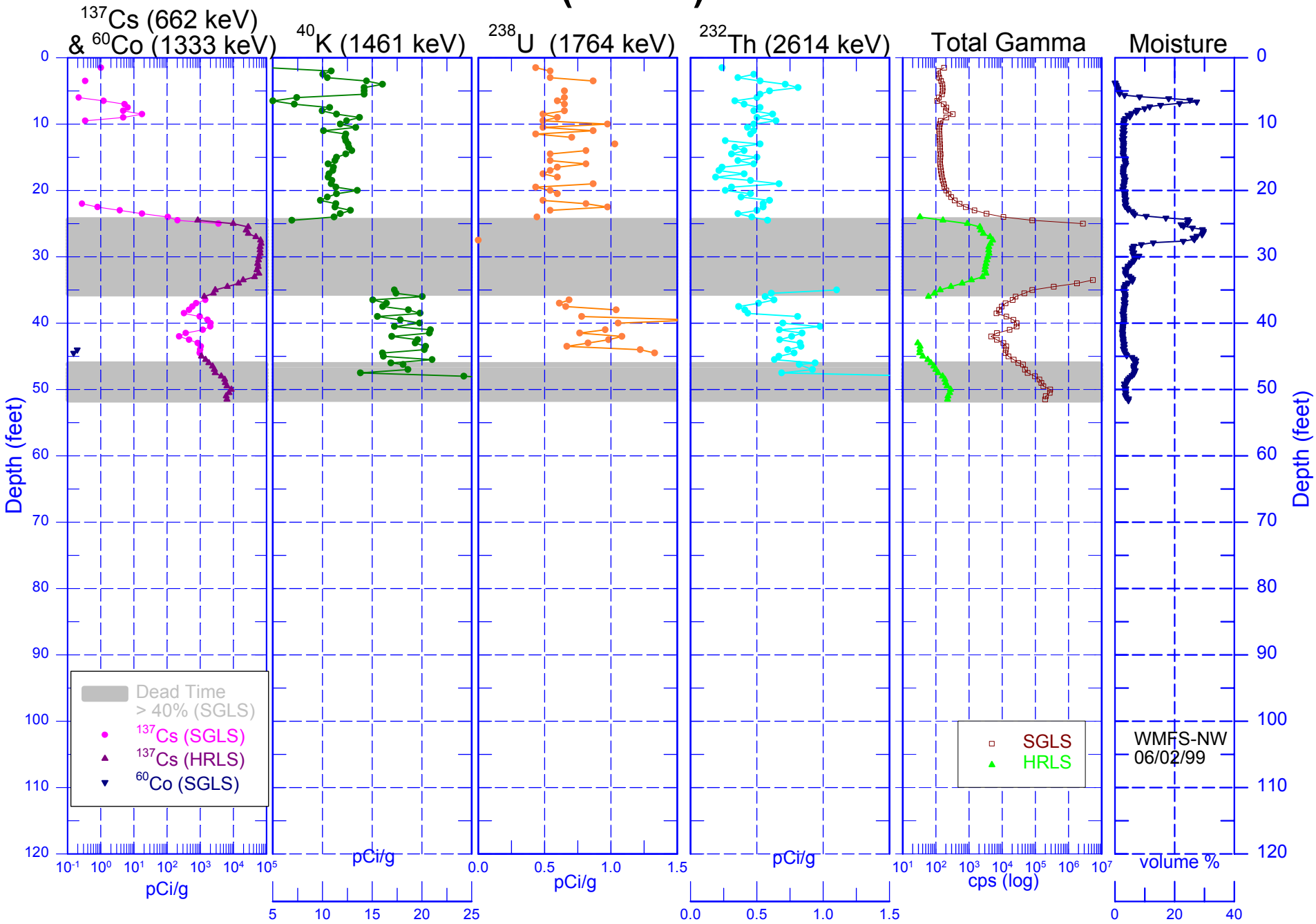
Natural Gamma Logs



299-E33-290 (A7086) Combination Plot



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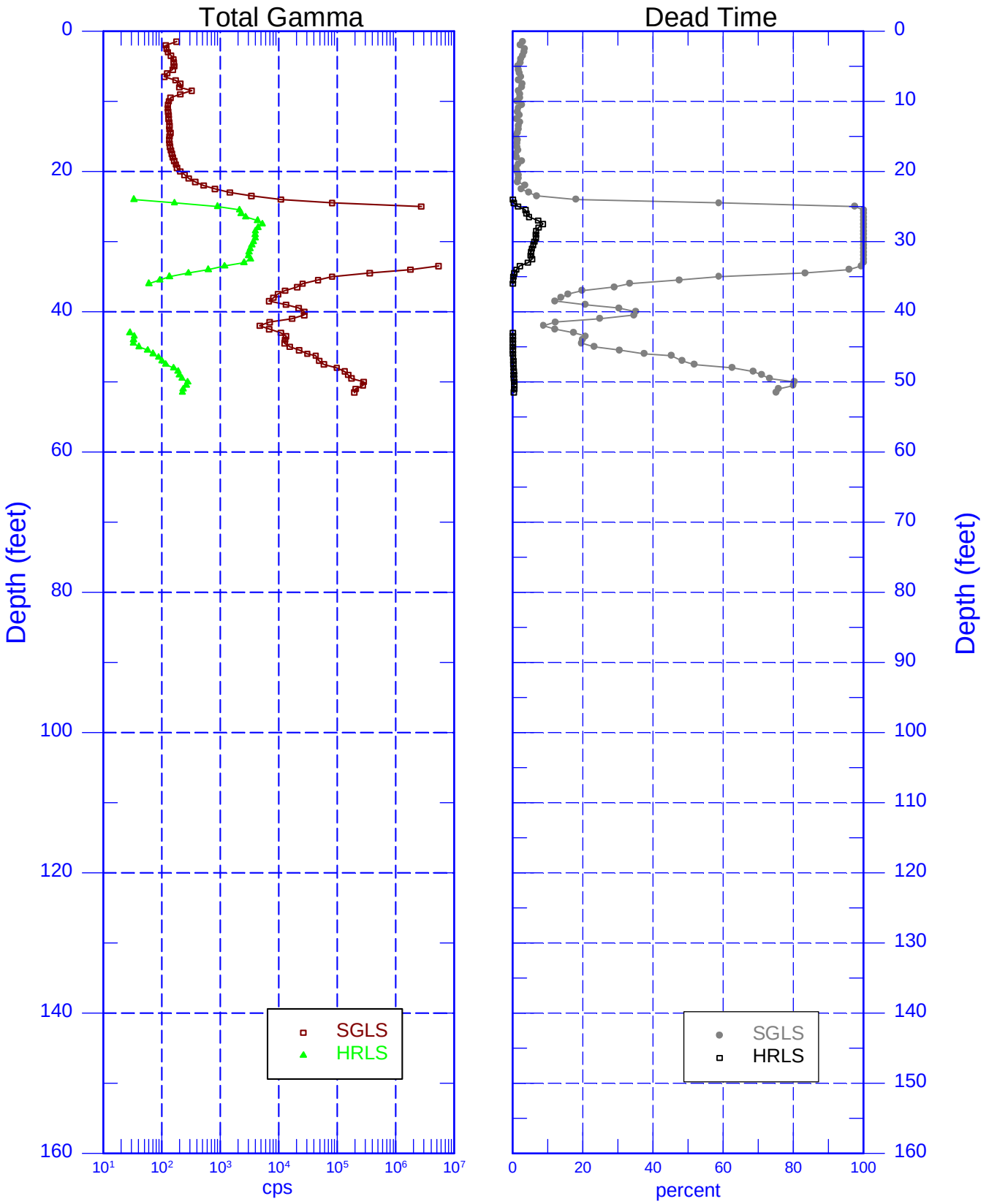
Total Gamma & Dead Time



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SGLS, HRLS, and RLS Comparison Plot